

AMENDMENTS TO THE CLAIMS:

Please amend claims 1, 3-6, 12-14, 20, 25, 26, 29, 30, 36, 43, 46, 48-50 and 54, and add new claims 56 and 57, as shown below.

This listing of claims will replace all prior versions and listings of claims in the Application:

Claim 1 (currently amended): A pump for moving a fluid comprising:

- a. an actuator housing having a chamber for housing the fluid, the chamber having ports for accommodating fluid flow through the chamber;
- b. a plurality of individual actuators located in the chamber and in contact with the fluid;
- c. ~~activating means~~ an activator for sequentially activating individual actuators, wherein each actuator, when activated, changes dimensions and exerts a displacing force on the housed fluid.

Claim 2 (original): The pump of Claim 1 wherein the actuator housing comprises two or more chambers for housing the fluid in flow connection.

Claim 3 (currently amended): A pump for causing a fluid to flow at a determined rate comprising the pump of Claim 1 wherein the ~~activating means~~ activator is caused designed to activate individual actuators at a time and sequence selected to displace the fluid at the chosen rate.

Claim 4 (currently amended): A pump of Claim 1 comprising in addition a controller for the ~~activating means~~ actuator whereby individual actuators are activated at a determined time.

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Claim 5 (currently amended): The pump of Claim 4 wherein the controller is a programmable microprocessor in electrical connection with the ~~activating means~~ activator.

Claim 6 (currently amended): The pump of Claim [[1]] 4 comprising in addition a sensor means for determining physical properties of the fluid wherein the sensor is in electrical connection with the ~~controlling means~~ controller and is capable of delivering signals received from the fluid to the ~~controlling means~~ controller.[[.]]

Claim 7 (original): The pump of Claim 1 wherein the physical properties to be sensed are selected from the group consisting of chemical composition, pH, pressure, temperature and flow rate.

Claim 8 (original): A pump for moving a fluid in a determined path comprising the pump of Claim 1 wherein the positions of the actuators in the actuator housing are selected to define the flow path for the liquid when displaced.

Claim 9 (original): The pump of Claim 8 wherein the actuator housing comprises more than one inlet port each port being capable of receiving an individual fluid and wherein individual flow paths are determined for each fluid.

Claim 10 (original): The pump of Claim 8 comprising two or more outlet ports.

Claim 11 (original): The pump of Claim 9 wherein the flow paths of individual liquids are allowed to intersect and thereby allow mixing of the displaced fluids.

Claim 12 (currently amended): A pump for moving a fluid at a determined rate and in a determined path comprising the pump of Claim 1 wherein said ~~activating means~~ actuator sequentially activates individual contiguous actuators at a selected time and the actuators are

located on one or more walls of the inner cavity at positions selected to define a flow path for the displaced liquid when the actuators are activated.

Claim 13 (currently amended): The pump of Claim 1 wherein the actuator housing is located inside a chamber containing the fluid, the chamber being a component of an on-line fluid processing system and the inlet port and outlet ports of the actuator housing are on the axis of flow in the fluid processing system. [[. ..]]

Claim 14 (currently amended): The pump of Claim 1 comprising in addition ~~connecting means~~ a connector for coupling the actuator housing into an on-line processing system.

Claim 15 original): The pump of Claim 1 wherein at least one of said actuators is positioned near the inlet port of the actuator housing and, when activated, forms a barrier preventing backflow of fluid from the actuator housing.

Claim 16 (original): The pump of Claim 1 comprising in addition an elastomeric impermeable lining located between the actuators and the housed fluid to prevent contact of the actuators and the fluid.

Claim 17 (original): The pump of Claim 1 wherein the actuators are essentially inert and non-reactive with the fluid.

Claim 18 (original): The pump of Claim 16 wherein the actuators are biocompatible.

Claim 19 (original): The pump of Claim 1 wherein individual actuators are each encased in an essentially inert material.

Claim 20 (currently amended): The pump of Claim 19 Claim 19 wherein[[.]] the material is semi-permeable to electrolytes.

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Claim 21 (original): The pump of Claim 17 wherein the material is non-permeable.

Claim 22 (original): The pump of Claim 1 wherein the actuators are reversibly responsive elastomeric materials selected from the group consisting of electroactive polymers, electrolytically activated polymer gels, optically activated polymers, piezoelectric polymers, piezoelectric ceramic materials, chemically activated polymers, magnetically activated polymers, magnetically activated polymers and shape memory polymers.

Claim 23 (original): The pump of Claim 1 wherein the actuators comprise electroactive polymers.

Claim 24 (original): The pump of Claim 23 wherein each actuator is electrically shielded from contiguous actuators.

Claim 25 (currently amended): The pump of Claim 23 comprising an electrical means circuit for activating individual actuators at a determined time.

Claim 26 (currently amended): The pump of Claim 23 comprising in addition a microprocessor in electrical contact with the electrical means circuit, the microprocessor being programmed to drive the electrical means circuit at a determined time whereby individual actuators are activated at a determined time and sequence.

Claim 27 (original): The pump of Claim 1 wherein the actuators comprise electroactive gels that are activated by contact with electrolyte.

Claim 28 (original): The pump of Claim 27 comprising a reservoir for housing an electrolytic solution.

Claim 29 (currently amended): The pump of Claim 28 comprising a permeable frit between the actuator and the electrolytic solution[[,]].

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Claim 30 (currently amended): The pump of Claim 1 wherein the actuators are polymer gels activated by contact with an electrolytic solution, individual polymers are each encased with a semi-permeable material, the actuator housing comprises a reservoir for housing electrolytic solution and a frit located frit located between the reservoir and the actuator and the activation activator means is an electrical circuit whereby electrolytic solution is caused to flow through the frit and semi-permeable material from the reservoir into contact with the polymer [[.]] and away from the polymer to cause reversible dimension change of the actuator.

Claim 31 (original): The pump of Claim 30 wherein the electrical circuit is operated by a remote control device.

Claim 32 (original): The pump of Claim 31 wherein the remote control device is infrared or radio-frequency driven.

Claim 33 (original): The pump of Claim 31 wherein the remote control device comprises a microprocessor programmed to activate the actuators at a selected time and sequence.

Claim 34 (original): The pump of Claim 1 wherein the actuators comprise optically responsive polymers.

Claim 35 (original): The pump of Claim 34 wherein the optically responsive polymers are ionized in the presence of light.

Claim 36 (currently amended): The pump of Claim [[343]] 34 wherein the optically responsive polymers change pH in the presence of light.

Claim 37 (original): The pump of Claim 36 wherein the polymers comprise anthracene.

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Claim 38 (original): The pump of Claim 34 wherein the activation of the optically active polymers is controlled by exposure to a laser beam of specific wavelength, natural light, a LED or a quantum light source.

Claim 39 (original): The pump of Claim 38 wherein the time of light exposure is controlled by a remote control device.

Claim 40 (original): The pump of Claim 39 wherein the remote control device is infrared or radio-frequency driven.

Claim 41 (original): The pump of Claim 34 wherein the control device is driven by a microprocessor, programmed to activate the actuators at a selected time and sequence.

Claim 42 (original): The pump of Claim 1 wherein the actuators comprise electroactive polymers that are directly activated by signal from an electrical circuit.

Claim 43 (currently amended): The pump of Claim 1 wherein the actuators comprise a chemically activated polymer.

Claim 44 (original): The pump of Claim 1 wherein the actuators comprise a magnetically active polymer.

Claim 45 (original): The pump of Claim 1 wherein the actuators comprise a thermally active polymer.

Claim 46 (currently amended): The pump of Claim 1 wherein the actuators comprise shape memory alloys.

Claim 47 (original): The pump of Claim 1 wherein the actuators comprise ceramic piezoelectric actuator.

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Claim 48 (currently amended): The pump of Claim 1 wherein the actuators comprise polymer/ceramic piezoelectric combinations.

Claim 49 (currently amended): The pump of Claim 11 as a fluid mixing device[[]].

Claim 50 (currently amended): A pump for propelling an object along a surface comprising:

- a. an actuator housing in contact with the object;
- b. a plurality of contiguous actuators in contact with the actuator housing and in contact with the surface; and
- c. ~~activating means~~ an activator for sequentially activating individual actuators, wherein each actuator, when activated, changes dimensions and exerts a displacing force on the surface and thereby propels the solid object [.] in a direction opposite that of the displacing force.

Claim 51 (original): The pump of Claim 50 for propelling an object suspended on a liquid surface.

Claim 52 (original): The pump of Claim 50 for propelling an object suspended on a solid surface.

Claim 53 (original): The pump of Claim 50 for propelling an object submerged in a liquid.

Claim 54 (currently amended): A method of pumping a fluid at a controlled rate comprising placing the actuator housing of ~~claim~~ Claim 1 into fluid contact with the fluid, activating a first actuator to prevent back-flow from the actuator housing and then repeatedly

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activating the contiguous actuators at a sequence wherein activation of one of the individual actuators occurs at a time after one of its contiguous actuators has been activated.

Claim 55 (original): The method of Claim 54 for pumping fluids of different viscosities wherein the pump comprises two or more actuator housings in fluid connection and each actuator housing is operated at a different flow rate.

Claim 56 (new): The pump of Claim 1 as an implantable infusion pump.

Claim 57 (new): The pump of Claim 1 as a drug delivery device for delivering a liquid drug or drug solution at a controlled rate and at a controlled time to an individual wherein the actuator housing comprises a single outlet port but no inlet port and houses the liquid drug or drug solution to be delivered.

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